Fall 2011 ENSO Discussion and Outlook

Andrew Snyder – Meteorologist Intern, NWS Wilmington OH

Summer 2011 has featured neutral conditions of the El Nino Southern Oscillation (ENSO) in the Pacific Ocean. This simply means that neither El Nino nor La Nina conditions were prevalent. Fig. 1 shows recent sea surface temperature (SST) anomalies in the equatorial Pacific, the primary indicator of ENSO conditions (above average SSTs indicate El Nino, while below average SSTs indicate La Nina). Anomalies within the past few months generally have been between 0 and 0.5 degrees. However, some of the global circulation patterns still reflect last winter's La Nina (such as enhanced convection just north of the equator from eastern Indonesia to the International Date Line, and suppressed convection south of the Equator near the Date Line). ENSO typically is weaker and impacts global weather patterns the least during the summer. Regardless, summer featured fairly persistent weather patterns across the United States. The dominant weather feature was a subtropical ridge of high pressure over the south central United States. This ridge became intertwined with the ongoing drought conditions to produce continued hot and dry conditions over this region. During the month of July, this ridge edged northward and eastward, producing one of the warmest Julys on record in much of the eastern two-thirds of the United States (a summary of the hot July can be found by clicking on this link).

As we head into autumn, ENSO trends may begin to reveal themselves as a precursor to what's to come for the winter months (when ENSO has its greatest influence on global circulation). Sea surface temperatures in the equatorial Pacific have been cooling some recently, but remain near neutral as of the end of August. However, all of the oceanic regions monitored for ENSO have begun to show a decreasing trend in SSTs, as shown in Fig. 2. Computer model forecasts (which are specifically tailored to predicting ENSO) are in general agreement that ENSO neutral conditions will continue into the fall months, although some models are trending to the onset of La Nina (Fig. 3). In the end, ENSO will likely have little effect on the weather in the Ohio Valley this fall. Nevertheless, we can still investigate historically what patterns of temperature and precipitation are most likely to occur during ENSO neutral years in the months of September, October, and November. This can be accomplished via box and whisker plots. These plots (for the Ohio climate zone) show the range of observations during each of the three ENSO categories. The "box" part of the diagram indicates the middle 50% (most likely range) of observations, with the majority of the remainder observations occurring along the "whiskers." La Nina falls tend to be the warmer than both El Nino and Neutral falls (Fig. 4). There is little distinguishable difference in terms of fall precipitation due to ENSO (Fig. 5), although neutral years have a slightly wetter distribution. Note that these charts are designed in reference to ENSO events and not to seasonal averages, although a rough 30-year climatological average is shown on the plots for reference.

When the influence from ENSO is limited, other factors are considered when making seasonal forecasts. These can include long term trends, other global circulation patterns, soil moisture, and both statistical and numerical climate forecast models. Using these methodologies, the Climate Prediction Center (CPC, producer of the official long range forecast for the National Weather Service) has predicted an increased chance of above average temperatures for much of the United States this fall (September-November, Fig. 6). In the Ohio Valley region, this forecast

was based largely on long term trends and computer models. In terms of precipitation this fall, there aren't any strong climatic signals, so the CPC has placed the region under "equal chances" of above, below, or near normal precipitation (Fig. 7). Keep in mind that these are seasonal trend forecasts and that daily and weekly weather will vary significantly. There may be times during the fall of below normal temperatures, even with an above normal forecast. More information on seasonal forecasts can be found at http://www.cpc.ncep.noaa.gov.

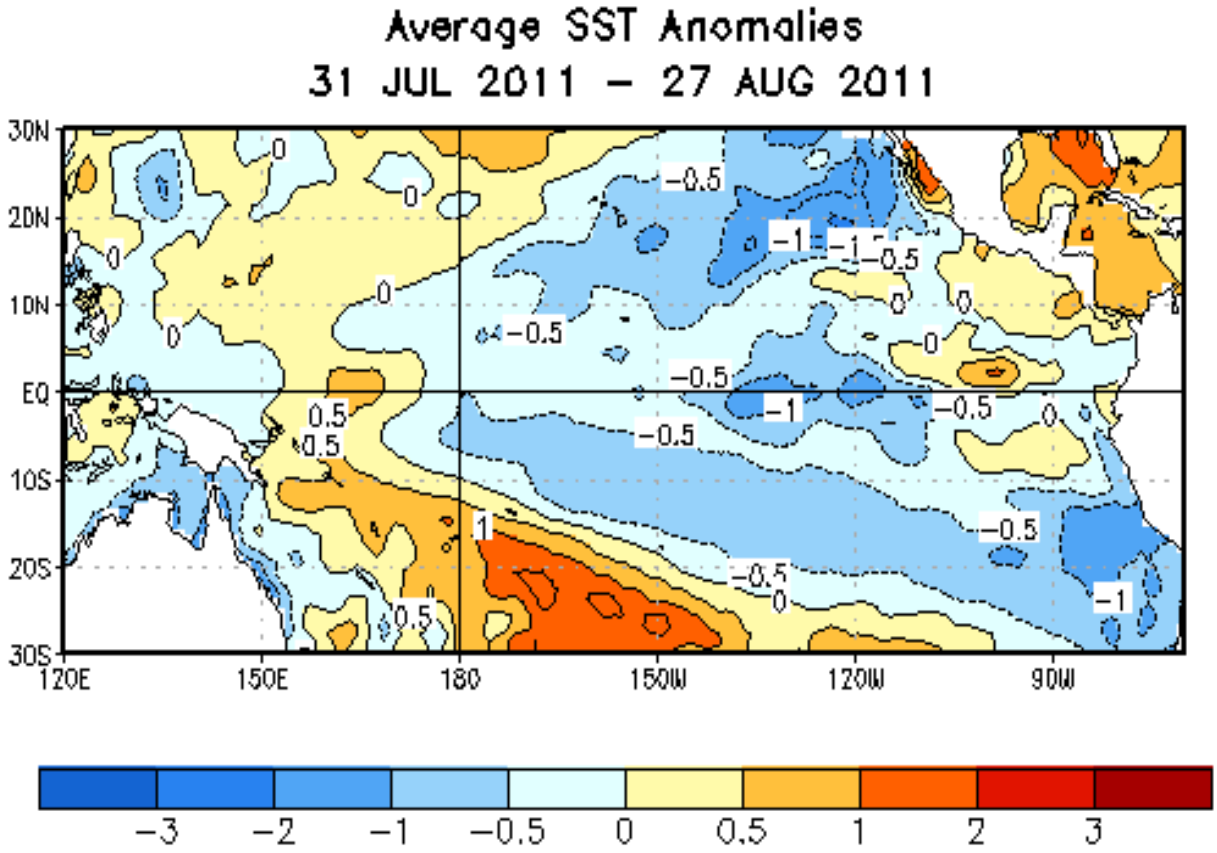

Fig. 1. SST anomalies over the equatorial Pacific during August 2011. Reds indicate above normal SSTs, while blues represent below normal values. The current values are generally just below zero over the eastern Pacific Ocean (right center of map). Image courtesy of CPC.

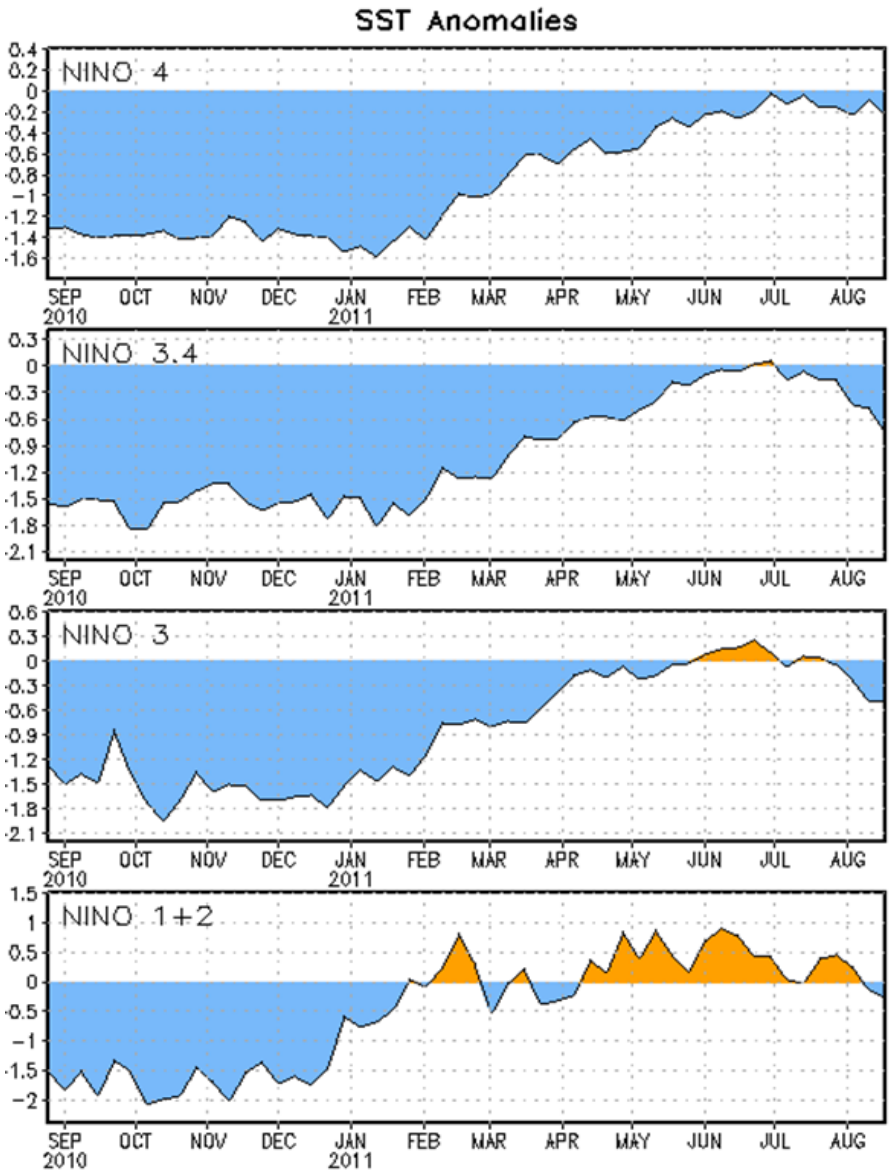

Fig. 2. SST anomaly trends over various regions of the equatorial Pacific Ocean over the past year. The blue color indicates cooler than normal SSTs. Notice the downward trend back into the blues during the past month (right side of graphs). Image courtesy of CPC.

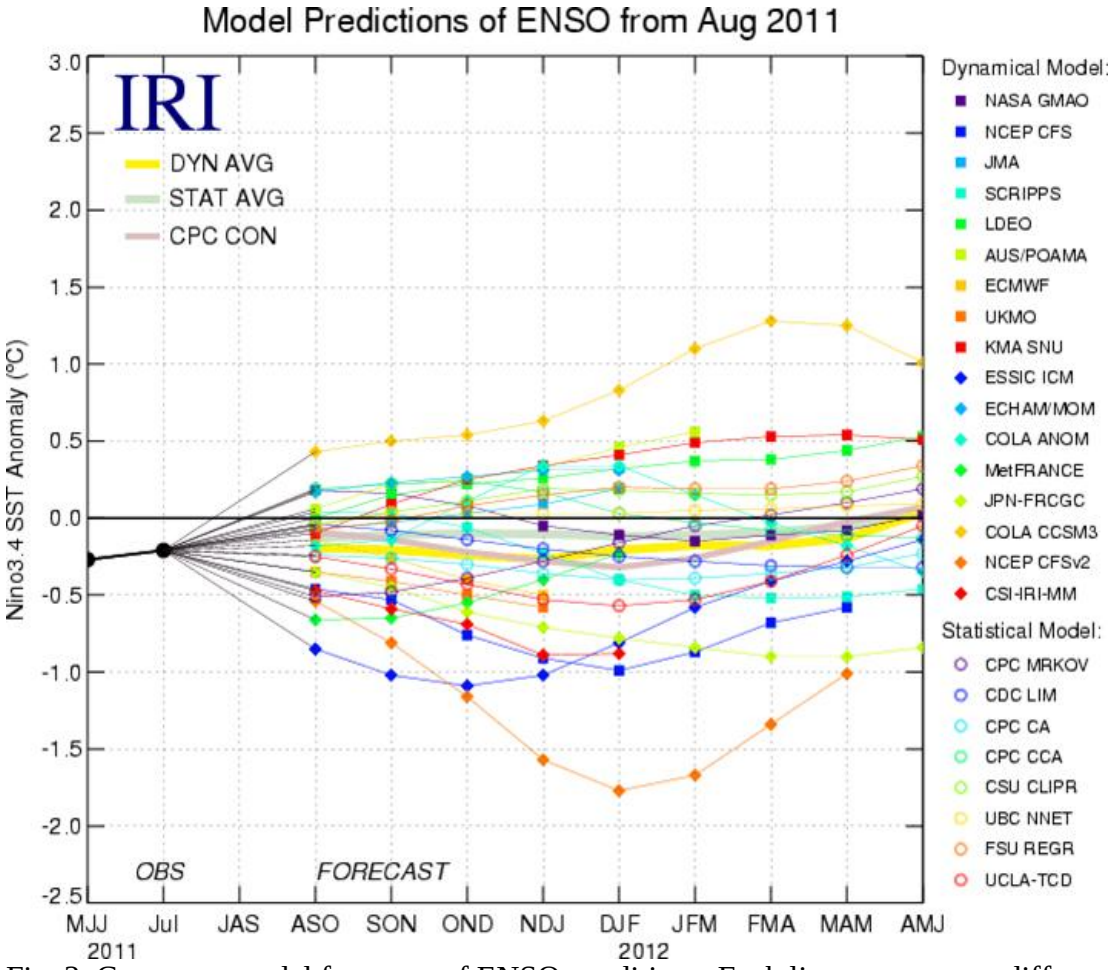

Fig. 3. Computer model forecasts of ENSO conditions. Each line represents a different computer forecast of SST anomalies. The solid yellow and beige lines represent the averages of several models. El Nino occurs with persistent anomalies of greater than 0.5ºC, while La Nina has persistent anomalies less than -0.5°C. Note most of the forecasts are centered around zero (solid line – ENSO neutral) through the fall season. However, many of the models show forecasts for negative anomalies. Figure provided by the International Research Institute (IRI) for Climate and Society (updated 16 August 2011).

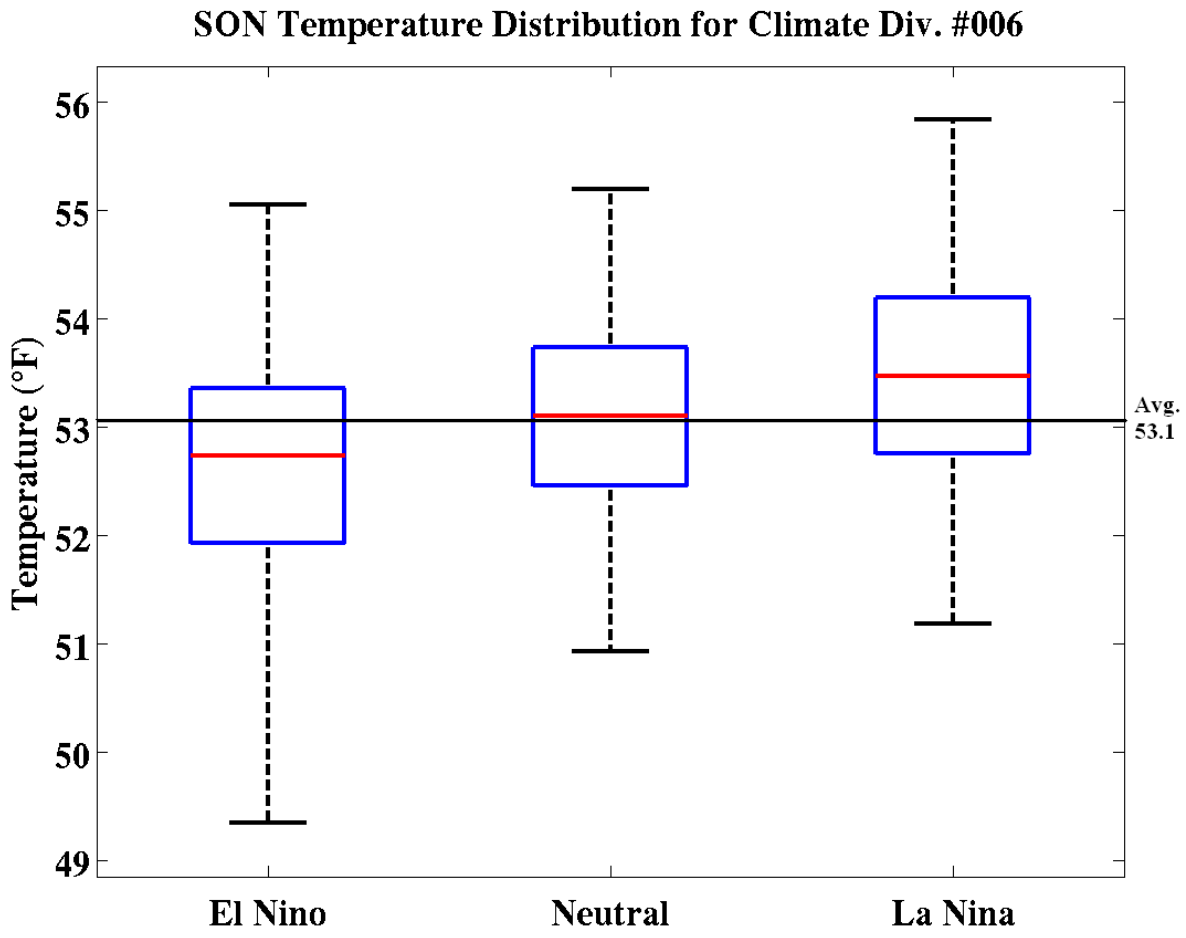

Fig. 4. Fall temperature distributions for the Ohio climate division based on ENSO activity. Temperatures during ENSO neutral years are an average between El Nino and La Nina as well as close to the climatological average. Image courtesy of CPC.

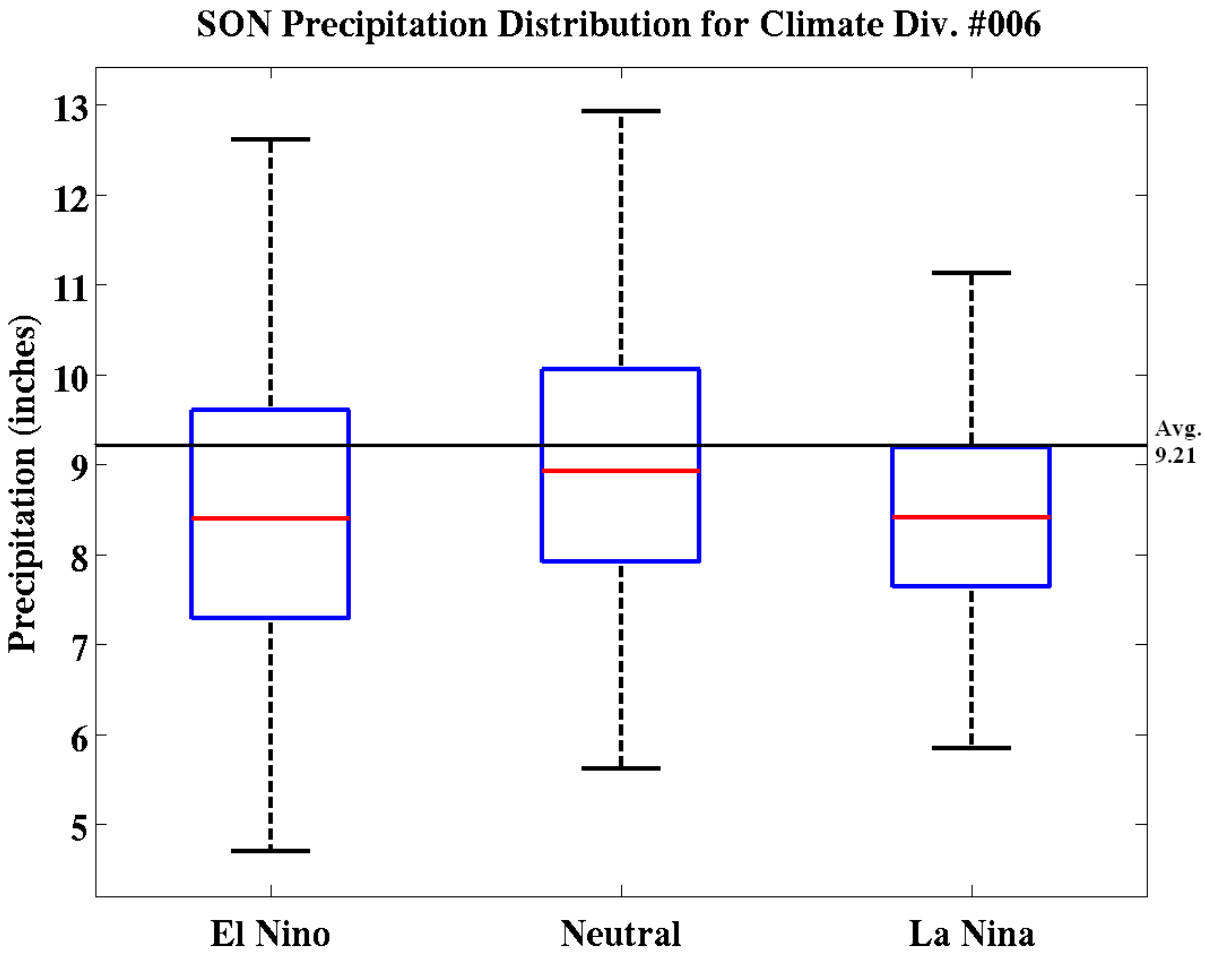

Fig. 5. Fall precipitation distributions for the Ohio climate division based on ENSO activity. There appears to be little connection between ENSO and fall precipitation. Image courtesy of CPC.

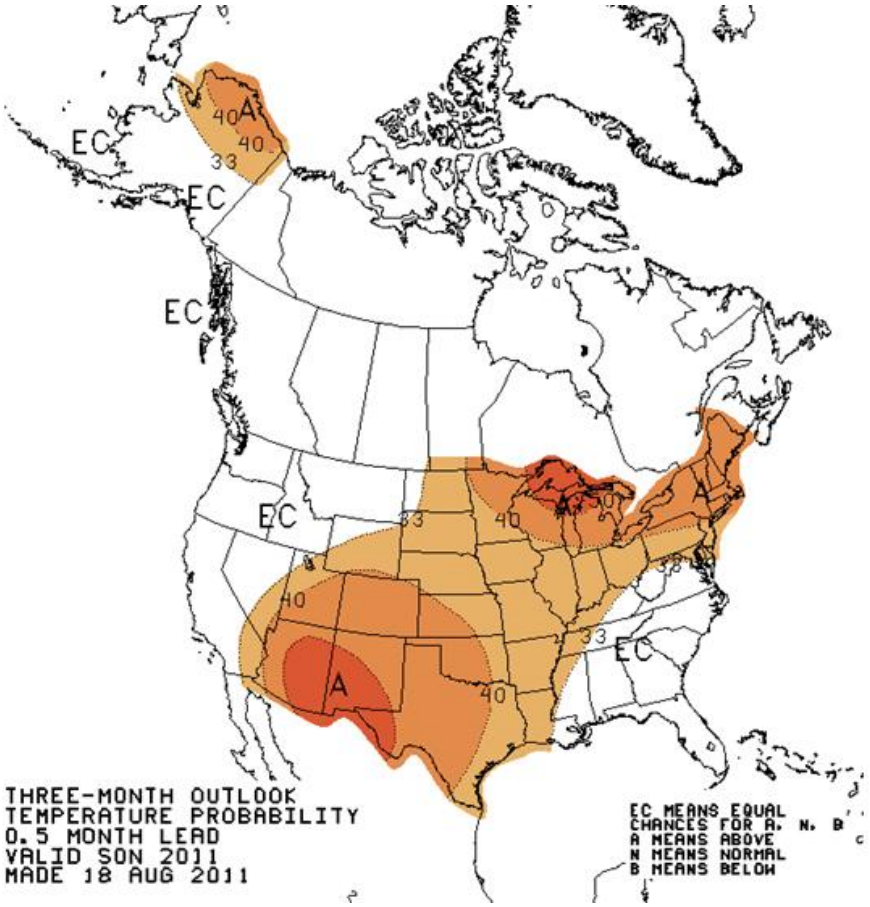

Fig. 6. Fall temperature anomaly outlook. The red shading indicates areas where expected conditions support a greater chance of above normal temperatures. Image courtesy of CPC.

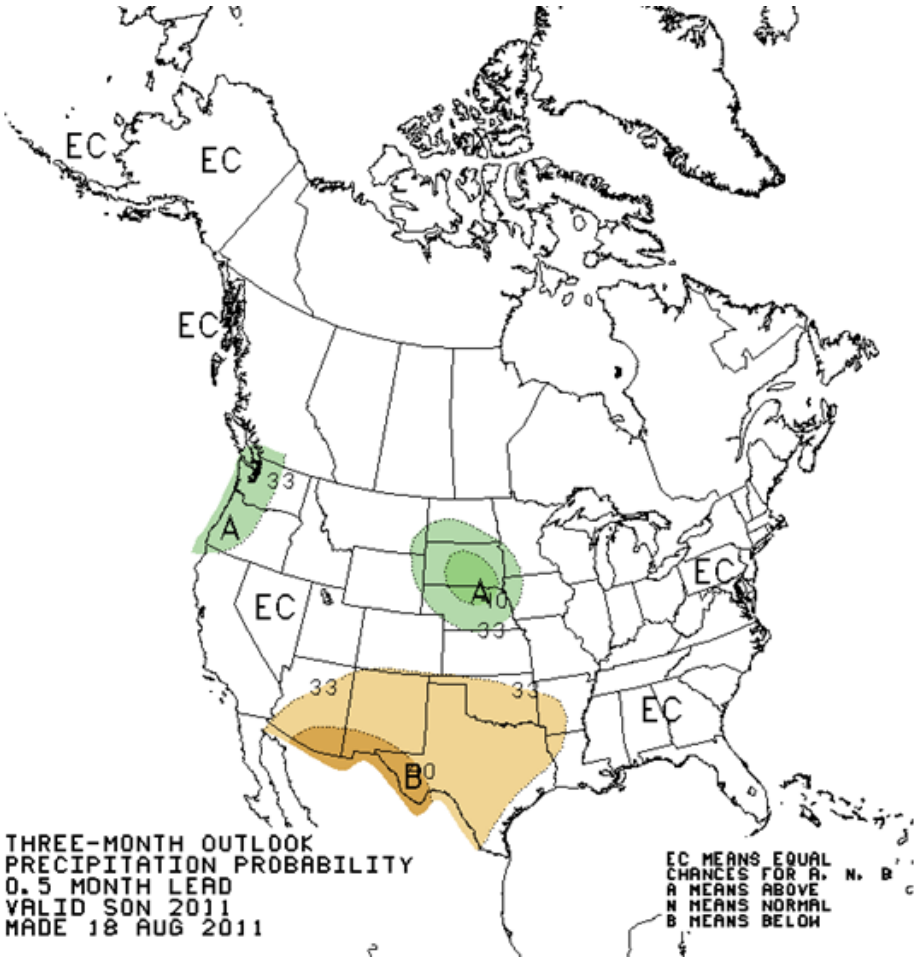

Fig. 7. Fall temperature anomaly outlook. Green shading indicates areas where expected conditions support a greater chance of above normal precipitation, while brown shading indicates where expected conditions support a greater chance of below normal precipitation. Image courtesy of CPC.